

AMENDMENT TO THE CLAIMS:

This listing of the claims replaces all prior versions, and listings, of claims in the application.

1. (original) A method for creating a multidimensional morphological reconstruction of biological data characterizing a biological tissue sample comprising the steps of:

cutting histologically thin sections of said sample to produce first and second sets of alternating serial sample sections;

constructing a multidimensional morphological spatial matrix of image data based on the first set of serial sample sections;

rasterizing the second set of alternating serial sample sections into a multidimensional spatial grid of indexed tissue samples, with indices of an indexed tissue sample indicating the location of the indexed tissue sample in the multidimensional spatial grid;

analyzing each indexed tissue sample to obtain biological data characterizing the indexed tissue sample; and

utilizing the indices of each indexed tissue sample to link the biological data characterizing each indexed tissue sample to the location in the multidimensional morphological matrix of image data corresponding to the indices of the indexed tissue sample.

2. (amended) The method of claim 1 where said step of analyzing comprises the acts of:

analyzing the tissue sample utilizing a monoclonal antibody binding to determine levels of proteins and other ligands.

3. (amended) The method of claim 1 where said step of analyzing comprises the acts of:

analyzing the tissue sample utilizing a micro array to determine levels of mRNA.

4. (amended) A method for creating a multidimensional morphological reconstruction of gene expression activity in a biological tissue sample comprising the steps of:

cutting histologically thin sections of said sample to produce first and second sets of alternating serial sample sections;

histologically-staining and overslipping said first set of serial sample sections for light microscopy;

utilizing the first set of histologically-stained serial sample sections to construct a multidimensional morphological spatial matrix of image data;

mounting and covering the second set of serial sample sections with a micro dissection membrane;

incising a grid pattern across each of the second set of serial sample sections to form a plurality of incised grid element sections on each serial sample section;

providing a set of indexed grid element holders with indexes indicating the identity of the serial sample section from which the grid element is incised and coordinate indices indicating the location of the grid sample element in the identified serial sample section;

transferring each incised grid element to the corresponding indexed grid element holder so that the indexed grid element holders form a spatial array preserving the location of the grid elements in the tissue sample;

analyzing each grid element to obtain ~~(biological)~~ gene expression data;

utilizing the index data to spatially superimpose gene expression data of each grid element onto the multidimensional morphological matrix of image data.

5. (amended) A method for creating a multidimensional morphological reconstruction of gene expression activity in a biological tissue sample comprising the steps of:

micro dissecting a tissue sample to obtain first and second sample sets of tissue samples indexed to a 3-D (three-dimensional) grid;

processing the first sample set to obtain a computer generated 3-D visualization of the tissue sample;

analyzing each sample in the second sample set to measure values of biological data;

spatially mapping biological data values of samples in the second sample set to corresponding indexed locations in the 3-D (three-dimensional) visualization.

6. (amended) The method of claim 6 5 further comprising the step of:

generating displays correlating values of biological data with corresponding location in the 3-D (three-dimensional) visualization.

7. (new) A method for creating a multidimensional morphological reconstruction of biological data characterizing a first biological tissue sample comprising the steps of:

constructing a multidimensional morphological spatial matrix of image data based on said first biological tissue sample;

rasterizing tissue from said first biological tissue sample into a multidimensional spatial grid of indexed tissue sub-samples, with indices of an indexed tissue sub-sample indicating the location of the indexed tissue sub-sample in the multidimensional spatial grid;

analyzing each indexed tissue sub-sample to obtain biological data characterizing the indexed tissue sub-sample; and

utilizing the indices of each indexed tissue sub-sample to link the biological data characterizing each indexed tissue sub-sample to the location in the multidimensional morphological matrix of image data corresponding to the indices of the indexed first biological tissue sample.

8. (new) The method of claim 7 where said rasterizing step comprises the steps of: cutting of histologically thin sections of said sample to produce first and second sets of alternating serial sample sections;

constructing a multidimensional morphological spatial matrix of image data based on the first set of serial sample sections; and

rasterizing the second set of alternating serial sample sections into a multidimensional spatial grid of indexed tissue samples, with indices of an indexed tissue sample indicating the location of the indexed tissue sample in the multidimensional spatial grid.

9. (new) The method of claim 7 where said rasterizing step comprises the step of: creating a set of tissue sub-samples where each tissue subsample corresponds to a specific multidimensional image pixel from the multidimensional morphological spatial matrix of image data based on said first biological tissue sample, and where each such sub-sample contains all of the tissue used to produce said image pixel.

10. (new) The method of claim 7 where said rasterizing step comprises:  
creating a set of tissue sub-samples where each tissue subsample corresponds, either directly or indirectly, to a specific range of multidimensional image pixels from the multidimensional morphological spatial matrix of image data based on said first biological tissue sample.

11. (new) A system for creating a multidimensional morphological reconstruction of biological data characterizing a first biological tissue sample comprising:

means for constructing a multidimensional morphological spatial matrix of image data based on said first biological tissue sample;

means for rasterizing tissue from said first biological tissue sample into a multidimensional spatial grid of indexed tissue sub-samples, with indices of an indexed tissue sub-sample indicating the location of the indexed tissue sub-sample in the multidimensional spatial grid;

means for analyzing each indexed tissue sub-sample to obtain biological data characterizing the indexed tissue sub-sample; and

means for utilizing the indices of each indexed tissue sub-sample to link the biological data characterizing each indexed tissue sub-sample to the location in the multidimensional morphological matrix of image data corresponding to the indices of the indexed first biological tissue sample.